"They were discovered about two and a half feet under the surface of a shallow bog, in the townland of Hillswood, parish of Kilconnell, county Galway; they were found stuck in a bunch in the ground, with the points down. No other relics appeared near them.

"I am yours very truly,
"G. W. HEMANS,
"*Chief Engineer.*

"*Edward Clibborn, Esq.*,
"*Assistant Secretary, R. I. A.*"

Rev. Dr. Robinson gave an account of a new anemometer.

He would not have been induced to add another to the numerous instruments of this kind already invented, but that he thought an exposition of the principles which guided him in its construction might be of use. The time, too, is auspicious, when, under the guidance of the President, we are forming an association to study the meteorology of Ireland. That, he hoped, was an example which would be widely followed, as in a most brilliant instance. Dr. Lloyd, in establishing the Dublin Magnetical Observatory, gave the first impulse to that splendid course of magnetic investigation, which is one of the proudest achievements of the present century. Other branches of meteorology have been brought to high perfection, but anemometry, one of the most important and closely connected with all the rest, is far in the back-ground,—not from neglect. Almost in the dawn of modern science we find Derham and Hooke engaged with it; and from them to the present day, a succession of instruments, many highly ingenious, show that it has been zealously, if not successfully cultivated. Yet it has borne but little fruit, because, as he thought, a wrong track had been followed in observation. What we want to know respecting wind is (along with its direction) its motion—the space through

which the particles of air are displaced. Instead of this, philosophers had observed the pressure, which is only useful as a means of giving the velocity. To this most of the anemometers on record were destined. They may be reduced to three classes. The first, extending from Hooke's to that which the President has recently constructed, consist of windmill vanes, made to face the wind by a vane or other contrivance, and acting against some graduated resistance which measures the pressure; the second, invented 100 years ago by the celebrated Bouguer, long used by a former illustrious President, Mr. Kirwan, and recently re-invented and brought into extensive use by Mr. Ossler, consists of a square plane, which, when exposed to the wind, compresses a spiral spring; and lastly, those which like Lind's, measure the pressure by the column of fluid which it can support. All these are open to the following objections:—First, their indications are most irregular. Wind is not a uniform rush of air; it is irregular to a degree which he could scarcely credit when he began his experiments. A river in flood, with its rapids, counter-currents, and eddies, gives but a faint idea of it; it may be likened to a bundle of filaments moving with all possible motions and contortions. Under such circumstances the pressure varies excessively. He had seen Lind in three or four seconds range from 0 to 3 inches, and, after long watching, could form no guess as to the true measure. In fact, the relative variations of pressure are twice those of velocity. And this innate source of irregularity is increased by the veering of the wind acting now full and now obliquely. It is also exaggerated by the inertia of the moving parts, which carries them beyond the place of balance. Secondly; in none of them can the relation between pressure and velocity be determined but by trial. In most, if not all, that relation is not constant. He insisted on this, because velocities deduced in the common way, from Ossler's gauge, were often one-third too great. Thirdly; it was of the utmost importance that these instruments should be self-registering. Now he

showed, that the mean velocity for any time cannot be concluded from the mean pressure, even when the relation between them is known. However, space measures were not entirely neglected. Lomonosoff, in 1749, contrived one which, by an ingenious arrangement, recorded the quantities of wind that blow from each point. Mr. Richard Lovell Edgeworth made one in 1783, which, though invented for another purpose, was used as an anemometer. It was a set of windmill vanes, revolving once for each foot of wind, and the turns reckoned by that beautiful contrivance now called the Cotton Counter, the invention of which is attributed by Willis to Dr. Wollaston. Dr. Wollaston, however, had seen this very instrument, of which he exhibited the fragments. It was made to measure the ascent of a balloon, and was used for this purpose by our countryman Crosby, in his perilous adventures in 1785, being saved by him in the sea. Woltman's hydrometric fly was proposed by him in 1790; but the person who first perceived the full advantages of this measure as an integral instead of a differential, and established its superiority in public estimation, was Dr. Whewell. This instrument, which was shown in Dublin to the British Association in 1835, recorded space and direction. It was used by many here—by Captain Larcom, but above all by that accomplished observer, Sir W. Snow Harris. He, in a most striking communication, in 1842, to the body just mentioned, gave his result, and at the same time pointed out some defects in the instrument, which led Dr. Robinson to turn his attention to the subject. In the following year he constructed the principal parts of the new anemometer, and has ever since been engaged in improving it. The principles which guided him were:

First. It should be so powerful, that friction can only slightly retard it.

Second. So large that it may include in its range a large assortment of aerial filaments, and thus give an average measure.

Third. It should move slowly, so as to require little wheel-work to bring down the space to the size of a sheet, and not be liable to rack itself to pieces.

Fourth. Should not require to be turned to face the wind.

Fifth. All made on the same model should tell the same story, without any trial or adjustment.

The four last decide against vertical windmills, and Dr. Robinson used an excellent form of the horizontal one suggested to him by Mr. Edgeworth, who once showed him the covers of a child's globe attached to a rod, and revolving in the wind by the excess of pressure on the concave and convex surfaces. He suggested that such a mill might be of economic use in many cases, particularly in drainage, as it required no care; and he referred to experiments by Dr. Corrigan and Mr. Bergin, where it did good work in pumping. He showed a model of it, and explained its action. Hydrodynamics are rather faithless as to impulses on oblique or curved surfaces; but in this case there appears to be a compensation in the errors of the theory, and it gives results surprisingly near those of actual experiment. He gave a sketch of the theory, showed how its constants were determined by experiment, of which in particular the resistance on the concave is four times that on the convex, and stated the experiments which gave the relations between the velocities of the wind and the centre of the hemispheres which act as vanes. Both concur in establishing the striking fact, that (except so far as friction interferes) the wind moves exactly three times as fast as the vanes.

He then described the instrument. The four hemispheres are a foot in diameter; their centres describe twelve feet in each revolution. It was necessarily of great height, sixteen feet, to clear the domes of the observatory, which has much increased its weight, twenty-four pounds, and with it the wear and friction. It was an old saying, "as swift as the wind," which, however, will not hold now! A train only as

swift as the wind would be a "slow coach," for the average speed of several years is but ten miles an hour. That, however, gives 1500 revolutions per hour, and no support of the lower pivot stood long; hard steel was replaced by stones. He showed an agate cup which was actually drilled after a year's work, and a sapphire which failed after two. At last he supported it entirely above on five balls of bronze, which bear both the vertical and lateral pressures. After a year's use they showed no signs of wear (they must be oiled), and the friction is but 1-300th of the load, being but 53 grains, of which 21 belong to the mill and 32 to the clockwork used in recording the observation. He described that clockwork. Two engraved circular papers are made to revolve; one by a direction vane, as the wind veers, the other by the windmill, at such a rate, that it turns one degree for every mile traversed by the wind, or once for 52,800 revolutions of the mill. The necessary train for this was arranged by one whose premature death is a heavy loss to science, the late Mr. Richard Sharpe. The time is recorded on these papers by pencils moved by the clock at the rate of six inches in twelve hours. That motion, combined with the space rotation, traces on its paper a spiral, contrasting most powerfully with the blurred and jagged stripes of pressure gauges. The direction-record is a sector shaded by the pencil, whose breadth depends on the veering of the wind. This, if exhibited in its full extent, would be very unsightly; and he described various contrivances to lessen it, in particular that used by the President, a supplemental windmill, which acted whenever the wind was oblique to the plane of its rotation, and turned the whole instrument. Dr. Robinson's arrangement is also very effective. In the first place the motion is communicated from the vane to the paper by a long spiral spring, in bending which many of the momentary changes are entirely expended; secondly, a large fan, like that of a blowing machine, exposing about sixteen square feet, and very light, is connected with it by a rapid speed. This moves with

the least impulse, if time be given, but presents great resistance to any rapid movement. The two reduce the excursions three-fourths. But he thought it would not be desirable to remove them entirely, even if possible, because he has found that this is a distinctive character of some winds, independent of their force. It is always connected with a tempestuous roar, which gives an exaggerated impression of their force; and some of the heaviest gales he has observed were comparatively noiseless. He then showed three of the sets of diagrams; one, of April 18th, the day of the storm which did such damage in Dublin, had nothing remarkable, except that from 3 to 5 there was a great change of direction to the eastward, and return to the original point, with a sort of unsteadiness that seemed to mark some struggle. The second was a gale on December 15, 1848, in which 516 miles in twelve hours were recorded. In the hour from 2 to 3, sixty-one miles were passed; and during two minutes and a half of it the velocity was at the rate of $105\frac{1}{2}$ miles per hour. This was a cyclone, or circular storm. But a still finer specimen of that was afforded by the third, in which 380 miles in twelve hours was marked, but the direction changed nearly through two entire circumferences.

He should have detailed the mode of combining the results thus obtained; but he felt he had already trespassed too long on their patience. He thanked the Academy for their indulgence, but referred it to the interest which they took in whatever tended to advance physical inquiry. He did not fear to be met by any body guided by such a President, much less by the Royal Irish Academy, with the utilitarian question, "Of what use is all this?" "Even on that ground we might encounter an objection. If, as in the case of the tides, we succeed in working out a theory of the winds, it would have a high commercial value. And why not? We know many of their causes, the temperature, the vapour, tension, the electricity of the atmosphere. We want only the anemome-

tric facts to guide us to laws. Even the little that has been done in the last few years, respecting cyclonic storms, has given birth to a system of hurricane navigation, that has saved British property and British life to an incalculable amount. But I feel that you think, with me, that we should disgrace ourselves if we took such humble ground. We hold that whatever adds to true knowledge, whatever widens the grasp of enlightened intellect, is precious; whatever opens a new view of the secrets of divine power and the majesty of creative wisdom is glorious, is inestimable."

Dr. Petrie read an account of the Cross of Cong.

"In offering to the Academy some account of the very interesting remain of antiquity now before us, and which is popularly known as the 'Cross of Cong,' I am but fulfilling a promise made long ago to the noble-minded and highly gifted man by whom it was presented to our institution; and while oppressed with the sad recollections which the performance of this duty naturally awakens, it is a great consolation to me, that I feel the time and the occasion to be peculiary appropriate to my task, and such as he would have himself desired, namely, when we are honoured with the presence at our meeting of the illustrious representative of our gracious monarch in Ireland, the viceroy whom we recognise as the friend of our institution, and the zealous and enlightened supporter of every pursuit and object tending to the social, moral, and intellectual improvement of the portion of the empire placed under his peculiar care.

"It would be wholly unbecoming in one of my humble intellectual station to offer any panegyrical observations on the general character of the eminent man to whom we are indebted for the possession of this remarkable remain, a man whose death has left a blank not easily to be filled, even in